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May 8th, 1848.

REV. HUMPHREY LLOYD, D. D., PRESIDENT, in the Chair.

Sir Robert Kane read the following account, by the Rev. Professor Callan, of Maynooth, on the use and construction of a new form of the Galvanic Battery :

" In a paper published in the August Number of the London Philosophical Magazine, I described several experiments, which clearly prove that, as a negative element of the nitric acid battery, lead coated with chloride of gold or platina, or with borax dissolved in dilute acid, is superior to platina, and that cast iron is fully as powerful as platina. I have since compared, in various ways, the power of a cast-iron battery with that of a Grove's of equal size. The cast iron was excited by a mixture consisting of about four parts of sulphuric acid, two of nitric acid, and two of nitre dissolved in water. The platina was excited by equal parts of concentrated nitric and sulphuric acid. The zinc plates of both batteries were excited by dilute sulphuric acid of the same strength. The cast-iron battery was considerably superior to Grove's, in its magnetic power, in its heating power, and in its power of producing decomposition. The magnetic effects of the two batteries were compared by means of a galvanometer and of a small magnetic machine. Grove's produced a deflection of 82°; the cast iron caused a deflection of 85°. When the voltaic currents of the two batteries were sent simultaneously in opposite directions through the helix of the galvanometer, the current from the cast-iron battery destroyed the deflection caused by Grove's, and produced an opposite deflection of 60°. In the magnetic machine the cast-iron battery produced fifty revolutions in a minute; Grove's produced only thirty-five in the same time.

" The superiority of the heating power of the cast-iron battery was shown by its fusing a steel wire, which Grove's only raised to a dull red heat. I have been told by persons who tried the two batteries, that they found the heating power of the cast-iron battery to be twice as great as that of Grove's.

" The decomposing powers of the two batteries were compared by the quantities of the mixed gases which they produced during the space of three minutes. The result clearly established the superiority of the cast-iron battery.

" I have tried various kinds of cast iron, and have found them all to possess nearly equal power. I have got cast iron plates containing oxide of chromium: they did not appear to have any advantage over common cast iron. Perhaps, by mixing with cast iron some of the more negative elements, an increase of power may be obtained.

" Soon after I had discovered the great electromotive power of platinized lead and cast iron, when excited by nitric or nitro-sulphuric acid, I proposed to the Trustees of the College to change our Wollaston batteries into a platinized lead or cast iron one. They readily authorized me to expend the sum required for the change. After weighing well the relative advantages of platinized lead and cast iron, I resolved on the latter, principally because I found that it did not require to be platinized. In one of our Wollaston batteries there were 300 zinc plates, each four inches square, and in the other twenty plates, each two feet square. In the two batteries the surface of the zinc plates was something more than 113 square feet; the copper surface was twice as great as the zinc surface. After mature reflection on the best form for the new battery, and on the most convenient size of the zinc plates, I resolved to get water-tight, cast-iron cells, rather than plates; to retain the 300 four-inch plates; and to divide the twenty large plates into 320 small ones, each six inches square. I therefore ordered 300 porous cells, each four and a half inches high, four and a half inches broad, and half an inch wide, for the four-inch plates; and 320 porous cells, each six and a half inches high, six and a half broad, and about an inch wide, for the six-inch plates. I also ordered 300 cast-iron, water-tight cells, each about four and one-eighth inches high, five inches broad, and an inch wide, to hold the small porous cells; and 320 cast-iron cells, each about six and one-eighth inches high, seven and a quarter broad, and one and three-quarters wide, to contain the large porous cells. The new battery then was to consist of 620 voltaic circles, in which the entire zinc surface would be 113 square feet, and the surface of cast iron would exceed 226 square feet; but on account of several disappointments I have been obliged to be content for the present with 577 voltaic circles, containing ninety-six square feet of zinc, and about 200 square feet of cast iron. In this battery, which was exhibited in the College on the 7th of the last month, there were 300 cast-iron, water-tight cells, each containing a porous cell and zinc plate four inches square; 110 cast-iron cells, each holding a porous cell and zinc plate six inches by four; and 177 cast-iron cells, each containing a porous cell and a zinc plate six inches square. The zinc plate of each circle was placed in a porous cell, and the latter in a cast-iron cell. The inside of each cast-iron cell was about a quarter of an inch wider than the exterior of its porous cell. Slips of sheet copper about an inch broad and two and a half inches long, were soldered to each cast-iron cell, and to each of the 320 six-inch zinc plates. The four-inch plates were already furnished with screws and nuts. Each iron cell was connected by a binding screw with the next zinc plate. The iron cells were kept in an upright position in nine wooden frames, which were placed on wooden supports nearly three feet high. The battery was charged by pouring into each cast-iron cell a mixture containing about twelve parts by measure of concentrated nitric acid, and eleven and a half parts of double rectified sulphuric acid; and by filling to the proper height each porous cell with dilute nitro-sulphuric acid, consisting of about five parts of sulphuric acid, two of nitric, and forty-five of water. In charging the entire battery we used about fourteen gallons of nitric and sixteen of sulphuric acid. I abstained from using the solution of nitre through an apprehension that it would cause the exciting mixture in the cast-iron cells to boil over. I know not whether this apprehension is well founded; but I know that when ten or more cells are employed, the exciting fluid in the cast-iron cells will soon boil over, and produce nitrous fumes, if it does not contain one quarter of its bulk of nitric acid.

" I have found by experiment that a cast-iron battery is about fifteen times as powerful as a Wollaston battery of the same size, and nearly as powerful and a half as Grove's. Hence our new cast-iron battery, in which there are ninety-six square feet of zinc, is equal in power to a Wollaston battery containing more than 1400 square feet of zinc, or more than 13,000 four-inch plates, and to a Grove's containing 140 square feet of platina. Now the battery made by order of Napoleon for the Polytechnic School, which was the largest zinc and copper battery ever constructed, contained only about 600 square feet of zinc; and the most powerful Grove's of which I have seen an account did not contain twenty square feet of platina. Hence the cast-iron battery belonging to the College is more than twice as powerful as the largest Wollaston, and seven times as powerful as the largest Grove's ever constructed.

" I shall now describe a few of the experiments which were made with our large cast-iron battery on the 7th of the last month. The first experiment consisted in passing the voltaic current through a very large turkey, which was instantly killed by the shock. The craw of the turkey was burst, and the hay and oats contained within it fell to the ground. In order to give the shock, a piece of tin-foil, about four inches square, was placed under each wing along the sides of the turkey, which were previously stripped of their feathers, and moistened with dilute acid. The tin-foil was kept in close contact with the skin by pressing the wings against the sides. The person who held the turkey had a very thick cloth between each hand and the wing, in order to save him from the shock. As soon as the wire from the zinc end of the battery was put in contact with the tin-foil under one wing, sparks were given by the tin-foil, and shocks received by the turkey, before the connexion was made between the negative end of the battery and the tin-foil under the other wing, although the negative and positive ends of the battery were on tables nearly three feet high, and three feet asunder.

" When a copper wire in connexion with the negative end was put in contact with a brass ring connected with the zinc end of the battery, a brilliant light was instantly produced. The copper wire was gradually separated from the brass ring until the arc of light was broken. The greatest length of the arc was about five inches. As soon as the connexion was made between the opposite ends of the battery by the copper wire, which was a quarter of an inch thick, and about five feet long, a loud noise was produced by the combustion of the solder which fastened some of the copper slips to the zinc plates. I immediately went to the part of the battery from which the noise proceeded, in order to try whether the connexion between the cast-iron cells and zinc plates was broken; I found one slip of copper detached from the zinc plate to which it had been soldered. There were probably others disconnected with their zinc plates, but I did not find them. The result of this experiment showed that the turkey conducted only a part of the current circulated by the battery, for the current which killed the turkey produced no combustion of the solder by which the copper slips were attached to the zinc plates.

" We next tried the ignition of charcoal points. We were not able to determine the length of the arc of light between them: for before Sir Robert Kane had time to separate them, they were burned away. The light was, of course, most brilliant: the charcoal scintillated like steel or iron. I never before observed these scintillations in the combustion of charcoal. Coke points were also ignited, and a most intense light produced; but during the experiments with the coke points the circuit was interrupted in consequence of the fracture of one of the porous cells, which caused the dilute and concentrated acids to mingle together, and, consequently, to boil over, until the porous and cast-iron cells were nearly emptied. Notwithstanding this interruption of the circuit, the arc of light between the coke points was about an inch long, and the heat of the flame deflagrated a file.

"I had arrangements made for a long series of experiments on the decomposing power of the voltaic current, and of voltaic heat, and on the illuminating power of the various kinds of voltaic light, but these experiments I was obliged to omit, through fatigue, exhaustion, and bad health. I have since tried the illuminating power of the light produced by the ignition of coke points; and for the gas microscope and polariscope have found it far superior to the oxyhydrogen lime light. With good coke points, abundant light for the microscope and polariscope may be obtained from a battery containing twenty-five cast-iron cells, and as many zinc plates, each two inches by four: if the coke be not very good, forty plates will be required. When an iron cell, two and a half inches wide and four inches high, is large enough to contain between it and the porous cell nearly a wine-glassful of the concentrated acids, the battery will work with undiminished power for about three hours without any additional acid. If the cell containing the zinc plates be small, it will be necessary to pour in a little dilute acid every half hour. I have got the lime light by igniting the mixed gases as they were produced by the decomposition of water, and throwing the flame on lime.

"*Maynooth College,*
"*April* 6, 1848."